REMARKS

The undersigned notes with appreciation that Claims 3, 4, 7, 15, 16 and 18-23 have been allowed, and that Claim 5 is drawn to allowable subject matter. Based on the remarks below, it is the position of the undersigned that all pending claims are entitled to patent protection

Claims 1-23 are pending in the application. No claims have been amended.

Claims 1, 2, 6, 13, 14, and 17 were rejected under 35 USC 102(b) as being anticipated by JP 09-61662 to Nishimura.

Claims 8-11 were rejected under 35 USC 103(a) as being unpatentable over Nishimura in view of US patent 5,815,318 to Dempewolf et al.

Claim 12 was rejected under 35 USC 103(a) as being unpatentable over Nishimura in view of US patent application 2001/0024548 to Hamanaka et al.

These rejections are traversed.

JP 09-61662 to Nishimura teaches an optical coupler having two lenses and two fibers symmetrically spaced to provide "optimal coupling". It is important to note that "optimal coupling" (herein understood to imply minimal coupling loss) can be attained over a wide range of L values (2L is the distance between lenses). Specifically, Fig. 4 of the present specification illustrates coupling loss versus L value. Fig. 4 indicates that coupling loss can be zero for any value of L less than Lmax. Hence, the teaching of "optimal coupling" in Nishimura does not necessarily imply that the L value meets the condition $1.8Lmax \leq 2L \leq 2Lmax$ specified in claim 1. Rather, "optimal coupling", according to Nishmura, with minimal coupling loss can be provided for L values outside this range. That is, the claimed design range $1.8Lmax \leq 2L \leq 2Lmax$ is a small area within a wide range of designs (e.g., a range of $0<2L \leq 2Lmax$) that can provide "optimal coupling".

In the present invention, the condition $1.8Lmax \leq 2L \leq 2Lmax$ tends to minimize the effect of focal length variations on the coupling loss. Specifically, when the L value meets the condition $1.8Lmax \leq 2L \leq 2Lmax$, variations in lens focal length do not result in substantial increases in coupling loss. This is explained in detail at page 11, lines 6-20, page 30, lines 2-18, and illustrated in Fig. 5. Variations in focal length can be caused by

1) axial chromatic aberration (see page 12, line 19), 2) humidity and temperature changes in the case of plastic lenses (see page 13, line 6) and 3) distortion in rod lenses (see page 14, line 4). Additionally, the present specification provides detailed calculations demonstrating the robust coupling in the cases of alignment asymmetry or lens defects. In the present invention, the effect of these imperfections is minimized because $1.8Lmax \leq 2L \leq 2Lmax$. Hence, the present invention as claimed provides unexpected and significant advantages for optical coupling systems. The advantages are amply described in the present specification. For example, as is shown on Table 3 on page 21 of the application, when L is sufficiently smaller than Lmax (as would be the case for some of the configurations of Nishimura) there is experienced coupling losses, but when L is substantially similar to Lmax (as required in claim 1), then the coupling loss is significantly reduced.

Clearly, data in the application demonstrates that the range contemplated by the inventors provides unexpected advantages that are beyond routine optimization and which are not contemplated or suggested by Nishimura. Accordingly, the present invention provides much more than mere "optimal coupling". Unlike Nishimura, the present invention provides optimal coupling *over a wide range of operating conditions and in the case of imperfect optical components*. With the present optical system having $1.8Lmax \leq 2L \leq 2Lmax$, the optical coupling efficiency is robust when perturbed by variations in lens construction, lens position, temperature and humidity. Nishimura cannot achieve this robustness. Nishimura is completely silent as to designing an optical system capable of optimal coupling in non-ideal operating conditions or imperfect components.

Nishimura does not teach or suggest that the optical coupling system can be designed to maintain high coupling in the face of variations in lens construction, lens position, temperature and humidity. Nishimura only teach that the lenses can be adjusted for optimal coupling. As noted, optimal coupling does not necessarily imply or suggest that $1.8Lmax \leq 2L \leq 2Lmax$. Nor would it be obvious to meet the $1.8Lmax \leq 2L \leq 2Lmax$ requirement from the teachings of Nishimura. This is because "optimal coupling" according to Nishimura can be achieved for any L value in the range of $0<2L<2Lmax$ (see Fig. 4).

Further, with reference to Figure 13 of Nishimura, what is shown is:

Lens distance: 2L = 323 mm

Distance between the light source optical fiber and the incident source: WD = 1.819mm (see Figure 13A).

According to Applicant's calculations, the maximum distance 2Lmax should be 2Lmax = 88.6 mm (WD is adjusted to WD = 1.88 mm) in Nishimura's lens and fiber for wavelength λ = 1550nm (see Figure 13B). Therefore, the disclosed 2L in Figure 13 is much smaller that the 2L max in Nishimura, and is thus clearly out of the range of $1.8\ Lmax \leq 2L \leq 2Lmax$. Applicants attach Appendix 1, where these distances are labeled, to further illustrate this point.

Accordingly, Nishimura does not teach or suggest an optical system with an L value in the range of $1.8Lmax \leq 2L \leq 2Lmax$. The rejection of claim 1, and the rejections of dependent claims 2, 6, 8-14, and 17 must therefore be withdrawn.

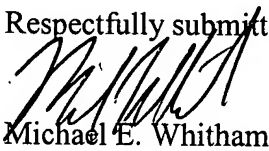
Dempewolf et al teach optical couplers having graded index lenses. Dempewolf et al. does not teach or suggest an optical coupler having two lenses separated by a distance so that the L value satisfies the relation $1.8Lmax < 2L < 2Lmax$. Consequently, no conceivable combination of Nishimura and Dempewolf et al. can produce the present invention as claimed in claims 1 or 2. Accordingly, the rejections of claims 8-11 should be withdrawn.

In view of the foregoing, it is respectfully requested that the application be reconsidered, that claims 1, 2, 6, 8-14 ad 17 be allowed, and that the application be passed to issue.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

A provisional petition is hereby made for any extension of time necessary for the continued pendency during the life of this application. Please charge any fees for such provisional petition and any deficiencies in fees and credit any overpayment of fees for the petition or for entry of this amendment to Attorney's Deposit Account No. 50-2041 (Whitham, Curtis & Christofferson P.C.).

Respectfully submitted,



Michael E. Whitham
Reg. No. 32,635

Whitham, Curtis, & Christofferson, P.C.
11491 Sunset Hills Road, Suite 340
Reston, VA, 20190
Phone: 703-787-9400
Fax: 703-787-7557

CUSTOMER NUMBER 30743